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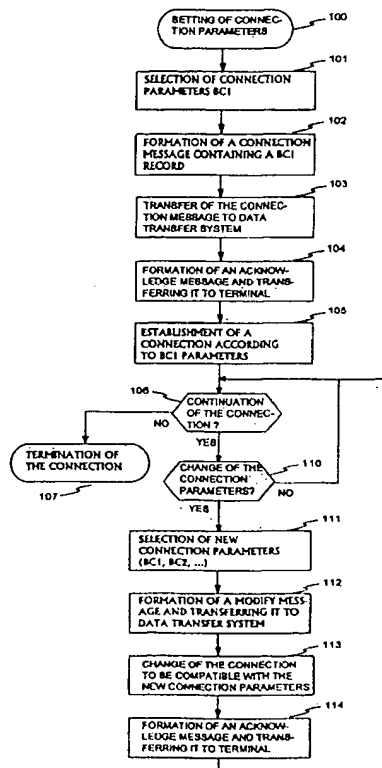
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(21) International Application Number: PCT/FI98/00120 (22) International Filing Date: 11 February 1998 (11.02.98) (30) Priority Data: 970596 12 February 1997 (12.02.97) FI (71) Applicant (for all designated States except US): NOKIA MOBILE PHONES LTD. [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI). (72) Inventors; and (75) Inventors/Applicants (for US only): HIETALAHTI, Hannu [FI/FI]; Koukkutie 5, FIN-90810 Kiviniemi (FI). SAARINEN, Tapio [FI/FI]; Hiekkalanlahdentie 4 as 4, FIN-90820 Kello (FI). (74) Agent: BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	

(54) Title: METHOD AND ARRANGEMENT FOR SETTING DATA TRANSFER PARAMETERS IN A DATA TRANSFER SYSTEM

(57) Abstract

The invention relates to a method and an arrangement for setting data transfer parameters in a data transfer system. The invention is applied preferably in a digital cellular system for changing a channel configuration during the connection. One idea of the invention is that a procedure is devised for transferring connection parameters between a terminal and a data transfer system during the data transfer connection (111-114). Thus it is possible to change the channel configuration of the connection when necessary, independently of the configuration selected at the establishment of the connection. By means of the solution according to the invention, data transfer connection can be established by setting first the parameters related to speech connection (101-105) and during the speech connection, the data transfer parameters can be changed when necessary to be suitable for data transfer (111-114). Then, at call set up, no data is needed on whether the data transfer connection can possibly be used for data transfer. Additionally, it is possible without disconnection to test the operation of different data transfer parameters in the context of the terminals being used.



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Method and arrangement for setting data transfer parameters in a data transfer system

5 The invention relates to a method and an arrangement for setting data transfer parameters in a data transfer system. The invention is applied preferably in a digital cellular system for changing a channel configuration during a connection.

10 In digital cellular systems, the connection parameters are generally set in the context of the establishment of a data transfer connection before the data transfer connection intended for the transfer of user information is established. For example, in a GSM (Global System for Mobile Communications) system, connection parameters of this kind are, amongst others, a codec which defines a data transfer rate, coding and parameters defining speech, data and fax transfer functions. Codecs currently in use are HR (Half Rate), FR (Full Rate) and EFR (Enhanced Full Rate) 15 codecs. Of these, the FR codec can be selected, according to the GSM system standard, for all devices connected to the system, but the HR and EFR codecs are optional in the devices. Connection parameters of a data link contain, amongst others, specifications concerning bits and bytes to be transferred. In the following, first a prior known procedure is described for setting connection parameters in a 20 GSM system and thereafter, the disadvantages associated with the prior art.

Prior to the establishment of a data transfer connection, a message for the establishment of the connection is transmitted from a mobile station to the data transfer system and it contains data concerning capabilities of devices for data 25 transfer in BC (Bearer Capability) data fields reserved for this purpose. When the mobile station has transmitted the message concerned to the data transfer system, the data system verifies the compatibility of the parameters contained in the message. Thereafter, the system transmits an acknowledge message to the mobile station confirming the reception of the message establishing the connection and the 30 data concerning whether the suggested parameters are compatible. In case that the suggested parameters are not compatible, it is possible to negotiate the parameters and change some of the parameters by transmitting new parameters in the acknowledge message.

35 In a BC data field, one can, for example, state that the terminal is capable of data transfer at the HR and FR data transfer rate. Then, during the connection, the data transfer system uses one of the data transfer rates concerned. The data transfer rate can be changed during the connection, for example, in the context of a change from

one base station to the next (handover). Then, for example, those base stations which are capable of using the HR data transfer rate, use it and the other base stations use the FR data transfer rate. The change of a codec occurs then controlled by the data transfer system within the framework of the BC data in use. The change
5 of the codec is implemented by using a so-called ASSIGNMENT or HO (Handover) procedure.

In addition, a procedure for alternating speech connection and data connection is prior known. In this case, the message for establishing a connection to be
10 transmitted during the establishment of connection contains two BC data fields. Of these, for example, the first data field BC1 is used for the configuration of the speech connection and the data field BC2 is used for the configuration of the data connection. During the connection, the configuration in use can be changed between configurations BC1 and BC2 which were specified during the establishment of the
15 connection. This change occurs by using a so-called ICM (In Call Modification) procedure.

The GSM system has been described in more detail, for example, in the publication [1] Mouly, Pautet: The GSM System for Mobile Communications, 1992, ISBN
20 2-9507190-0-7.

There are many disadvantages associated with the solutions according to the prior art described above. First, a connection which has been set up as a plain speech connection cannot be converted to a data connection during the connection. If,
25 during a speech connection there arises a need, for example, to send a fax, the speech connection has to be disconnected and a new connection established which is configured for a fax transfer in the stage of the establishment of connection. Although the need for several channel configurations would be known already at the establishment of connection, it is not possible to use more than two sets of
30 connection parameters during the same connection in the solutions according to the prior art. Thus, for example, during a speech/data connection, one cannot send faxes. Instead one must establish a new connection to perform this task.

Another disadvantage associated with the prior art is that one has to know the
35 parameters of the data transfer connection already at the establishment of connection. If, for example, the device configuration of a terminal may vary, parameters relating to the wrong device configuration may be selected when the connection is established, in which case the connection has to be established again

for the correction of the parameters. Such a situation may arise especially for the reason that the peripheral attached to the terminal is not connected when the connection is established and the system reports this only after the connection has been established.

5

Problems arise especially in a situation where the appropriate data transfer parameters are not known at the establishment of connection but they have to be found out by trial and error. During this procedure, one has to establish many speech connections to agree on the trial parameters with the other party and many data
10 connection trials for testing the agreed trial parameters.

Additionally, the use of the solutions according to the prior art is made difficult by the fact that separate subscriber numbers are usually required for speech, data and fax functions and for their transposition functions.

15

As is obvious from the above described examples, the procedure according to the prior art is in many operating situations multi-stage and awkward, and therefore the total time needed for transferring the necessary data may become unreasonably prolonged.

20

One idea of the invention is that a procedure is devised for setting connection parameters during the data transfer connection. Then it is possible to change the channel configuration of the connection when necessary, independent of the configuration selected at the establishment of connection.

25

By means of the invention, many advantages are achieved compared to the prior art. By means of the solution according to the invention, data transfer connection can be established by setting first, for example, connection parameters relating to the speech connection and during the speech connection, the connection parameters can
30 be changed so that they are suitable for data transfer when necessary. Thus, at the call setup, no information is needed on whether the data transfer connection will possibly be used for data and/or fax transfer, nor information on the parameters to be used in this kind of transfer. During speech connection it is also possible to find out the operation of different data transfer parameters in the context of the terminals
35 in use. Furthermore, one advantage of the invention is that separate subscriber numbers needed for speech, fax and data transfer functions and their transposition functions (multiple numbering scheme) can be substituted by a single subscriber

number (single numbering scheme). Thus the invention makes the single numbering scheme a viable solution.

A method according to the invention for setting data transfer connection parameters in a data transfer system is characterized in that

- 5 - the connection parameters which are to be used in the data transfer connection are selected after the establishment of the data transfer connection,
- data referring to the selected connection parameters is transferred between the terminal and the data transfer system and
- the connection parameters used by the data transfer connection are changed to be
10 compatible with the transferred connection parameters.

A data transfer system according to the invention comprising the means for transferring the first connection parameters between said data transfer system and a terminal connected to it and the means for establishing data transfer connection on a
15 traffic channel on the basis of said first connection parameters, is characterized in that it comprises the means for transferring the second connection parameters between said data transfer system and said terminal during said data transfer connection and the means for changing the connection parameters used in said data transfer connection on the basis of said second data transfer parameters.

20

A terminal according to the invention comprising the means for transferring the first data transfer parameters between the terminal and the data transfer system and the means for establishing data transfer connection to the data transfer system on the basis of said first data transfer parameters, is characterized in that the terminal
25 comprises the means for transferring the second data transfer parameters between the terminal and the data transfer system during said data transfer connection and the means for changing the connection parameters used in said data transfer connection on the basis of said second data transfer parameters.

30 Preferable embodiments of the invention have been presented in dependent claims.

The invention is described in the following in more detail by means of the attached drawings in which

35 fig. 1 shows a flow diagram of a method according to the invention for setting connection parameters and

fig. 2 shows a block diagram of a mobile station according to the invention and its connection to a cellular system according to the invention.

Fig. 1 shows a flow diagram of a method according to the invention for setting
5 connection parameters 100. Prior to the establishment of connection, the first
connection parameters BC1 are selected, phase 101. Thereafter, a message for the
establishment of connection is formed in the terminal and it contains a record for
transferring the connection parameters BC1, phase 102. The formed connection
message is subsequently transferred to the data transfer system, phase 103. After
10 receiving the connection message, the data transfer system forms an acknowledge
message and transmits it to the terminal, phase 104. Thereafter, a data transfer
connection is established by using a channel configuration according to the selected
connection parameters BC1, phase 105.

15 When the connection has become established, the channel configuration defined at
the establishment of the connection is used until it is necessary to terminate the
connection, phases 106, 107, or until it is desired to change the connection
parameters, phase 110. When one desires to change the channel configuration, new
connection parameters BC2 are selected, phase 111. Thereafter, a MODIFY
20 message is formed which contains data of the new connection parameters and the
MODIFY message is transmitted from the terminal to the data transfer system,
phase 112. After having received the MODIFY message, the data transfer system
verifies the compatibility of the suggested parameters and changes the channel
configuration of the connection to be compatible with the new connection
25 parameters, phase 113. Thereafter, the data transfer system transmits to the terminal
an acknowledge message MODIFY COMPLETE which contains a confirmation
concerning the new channel configuration, phase 114, after which it is returned to
phase 106. If the data transfer system does not support the channel configuration
suggested in the MODIFY message, it transmits a MODIFY REJECT message as an
30 announcement that the connection parameters cannot be changed in the suggested
way. The MODIFY REJECT message contains the connection parameters which
were valid before the transfer of the MODIFY message.

The above described change of connection parameters can be performed several
35 times during the connection. If one wishes to return to the earlier used channel
configuration during the connection, also then a new MODIFY message is
transmitted.

Above, the transfer of connection parameters in a message according to an ICM procedure of the GSM system has been described. Within the framework of the invention, also other procedures of message transfer for transferring new connection parameters can, however, be devised to the GSM system.

5

Above, a procedure for transferring messages has been described in a case when the change of connection parameters is activated from a mobile station. The connection parameters can naturally be changed so that they also are activated by the data transfer system, in which case the data transfer system transmits to the terminal a
10 MODIFY message containing the selected new connection parameters. Thereafter, the terminal transmits an acknowledge message MODIFY COMPLETE to the data transfer system which, after having received the message, readjusts the connection parameters to the selected new parameters. If the terminal does not accept the suggested connection parameters, it transmits a MODIFY REJECT message
15 containing the valid connection parameters to the data transfer system. After having received this message, the data transfer system leaves the connection parameters unchanged.

Fig. 2 shows a simplified block diagram of a mobile station 200 according to the
20 invention and its connection to the cellular system. In Fig. 2, only the essential parts of the mobile station considering the application of the invention have been shown. The mobile station comprises an antenna 201 for receiving a radio frequency signal, i.e. an RF signal transmitted by a base station. The received RF signal is controlled, for example, by a duplex filter 202 to an RF receiver 211 in which the signal is
25 amplified and converted into a digital form. Thereafter, the signal is detected and demodulated, block 212, and decoding is performed in block 213 according to the connection parameters.

If the connection has been defined as a speech connection, speech signal processing
30 is performed to the received signal and in it, the signal is also converted into sound, block 230. If the connection has been defined as a fax or data connection, the decoded data can be transferred to an external data processing device through an interface in the mobile station. Alternatively, the received data can be processed in the mobile station, for example, by storing data in a memory 204 and showing it on
35 a display 232. Respectively, the messages received from the data transfer system can be stored in the memory 204 and shown on the display 232 when necessary.

The above mentioned processing operations of data transfer are controlled by a control unit 203. The control unit also performs the formation and interpretation of the messages according to the invention.

5 For transmission of speech, in a mobile station there is a processing block for a speech signal 233 which converts an acoustic signal into a digital electric signal. If the information to be transmitted is data, it can be read from the memory 204 or received from an external data processing device through an external interface. Thereafter, the data to be transmitted is coded in block 221 according to selected connection parameters. From the coded data, bursts are formed, block 222, which
10 are modulated into an RF signal to be transmitted in block 223. The RF signal to be transmitted is transferred to an antenna 201, for example, through a duplex filter 202. Also the above mentioned data processing and transmitting functions are controlled by the control unit 203.

15 The blocks of the mobile station according to the invention can be formed by means of components known per se. A control unit controlling other blocks, however, performs the control operations for the blocks according to distinct software and thus the above described functions of the blocks according to the invention are achieved.

20

Fig. 2 shows additionally the parts of a cellular system which are used in the establishment of connection and data transfer. The RF signal is transmitted and received through an antenna 250 of a base station 251. Data transfer connection is established from the base station 251 further to a switching center 253 through a
25 base station controller 252. The switching center 253 is additionally linked to other base stations of the system and, for example, to the public switched telephone network PSTN. The other party of the data transfer connection can gain access to the data transfer system via the base station, such as a mobile station 200, or alternatively, via a fixed telephone network PSTN.

30

The functions according to the invention are performed in the base station of a cellular system by similar means as in a mobile station.

35 Only some embodiments of the invention have been described above. The principle according to the invention can naturally be modified within the frame of the scope determined by the claims, for example, by modification of the details of the implementation and ranges of use.

Especially the GSM data transfer system has been described only as examples and the application of the invention is in no way restricted to it. The invention can preferably be used, amongst others, in GSM, PCN, DCS, UMTS or FPLMTS
5 cellular systems. The invention can be applied, in addition to the mobile station systems, also for fixed data transfer systems, such as, for example, in ISDN and B-ISDN systems.

Claims

1. A method for setting data transfer connection parameters in a data transfer system. **characterized** in that
 - 5 - connection parameters used in the data transfer connection are selected after the establishment of the data transfer connection (111),
 - data of the selected connection parameters is transferred between the terminal and the data transfer system (112) and
 - 10 - the connection parameters used by the data transfer connection are changed to be compatible with the transferred data transfer connection parameters (113).
2. A method according to claim 1. **characterized** in that before the establishment of the data transfer connection, data transfer parameters for speech connection are selected and set (101-105) and after the speech connection has been established,
 - 15 data transfer parameters of the connection for data and/or fax connection are selected and set (111-114).
3. A method according to claims 1 or 2. **characterized** in that during the data transfer connection, at least three sets of connection parameters are used.
 - 20
4. A data transfer system which comprises the means for transferring the first connection parameters between said data transfer system and a terminal connected to it (103) and the means for establishing a data transfer connection on a traffic channel on the basis of said first connection parameters (105). **characterized** in that
 - 25 it comprises the means for transferring the second connection parameters between said data transfer system and said terminal during said data transfer connection (112) and the means for changing the connection parameters used in said data transfer connection on the basis of said second data transfer parameters (113).
- 30 5. A data transfer system according to claim 4. **characterized** in that it comprises the means for establishing a speech connection (105) and the means for transferring the connection parameters between the terminal and the data transfer system (112) for changing the connection to a data and/or fax connection to be compatible with the transferred connection parameters (113).
 - 35
6. A terminal which comprises the means for transferring the first data transfer parameters between the terminal and the data transfer system and the means for establishing a data transfer connection to the data transfer system on the basis of

5 said first data transfer parameters. **characterized** in that it comprises the means (201-223) for transferring the second data transfer parameters between the terminal and the data transfer system during said data transfer connection and the means (203, 213, 221) for changing the connection parameters used in said data transfer connection on the basis of said second data transfer parameters.

10 7. A terminal according to claim 6. **characterized** in that it comprises the means (201-223) for establishing a speech connection to the data transfer system, the means (201-223) for transferring the connection parameters between said terminal and data transfer system and the means (203, 213, 221) for changing the connection to a data and/or fax connection to be compatible with the transferred connection parameters.

15 8. A method according to any of claims 1-3, a data transfer system according to any of claims 4-5 or a terminal according to any of claims 6-7. **characterized** in that said data transfer system is essentially a GSM system.

20 9. A method, a data transfer system or a terminal according to claim 8. **characterized** in that data of new connection parameters is included in a MODIFY message transferred between the terminal and the data transfer system.

25 10. A method according to any of claims 1-3, a data transfer system according to any of claims 4-5 or a terminal according to any of claims 6-7. **characterized** in that said data transfer system is a GSM, PCN, DCS, UMTS, FPLMTS, ISDN or B-ISDN system.

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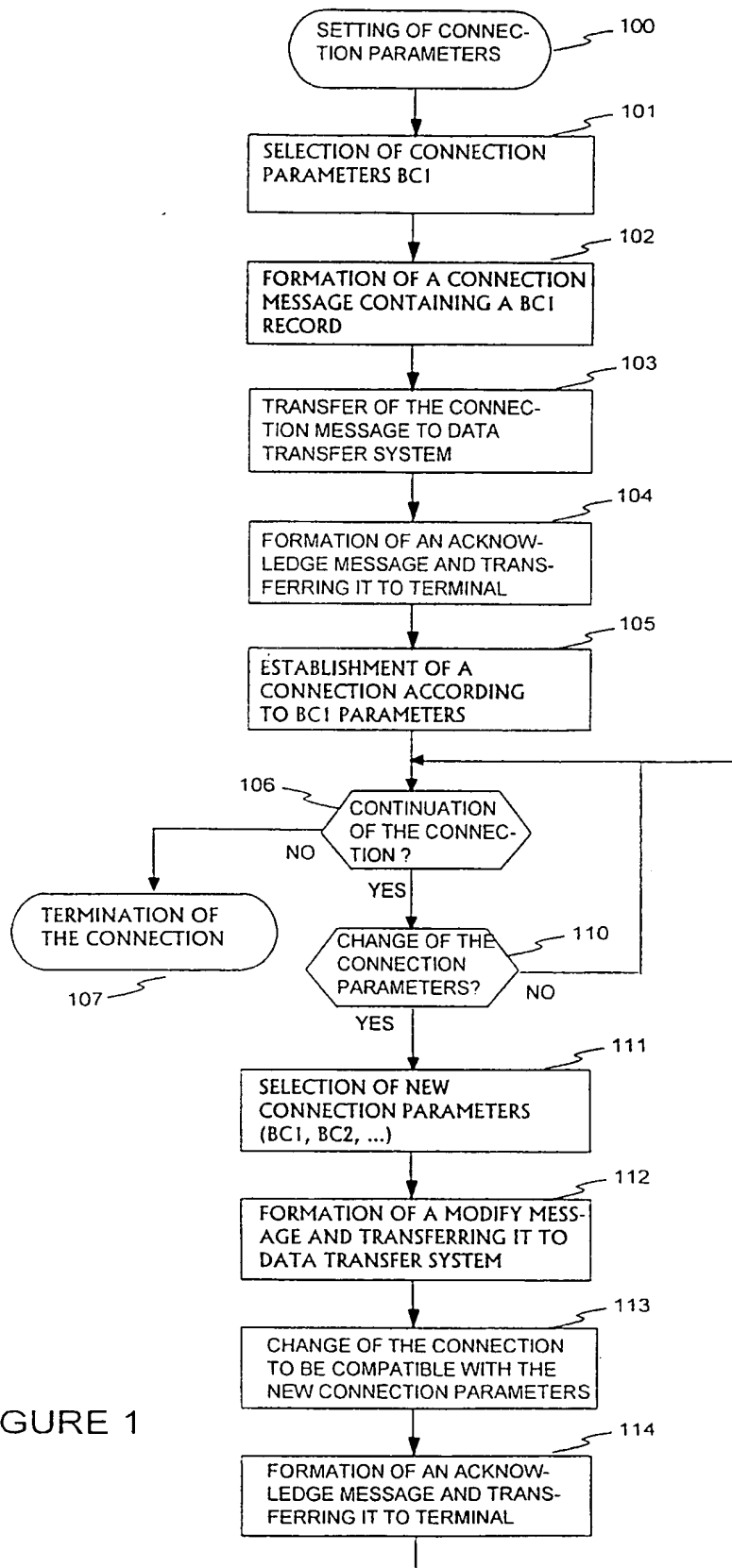


FIGURE 1

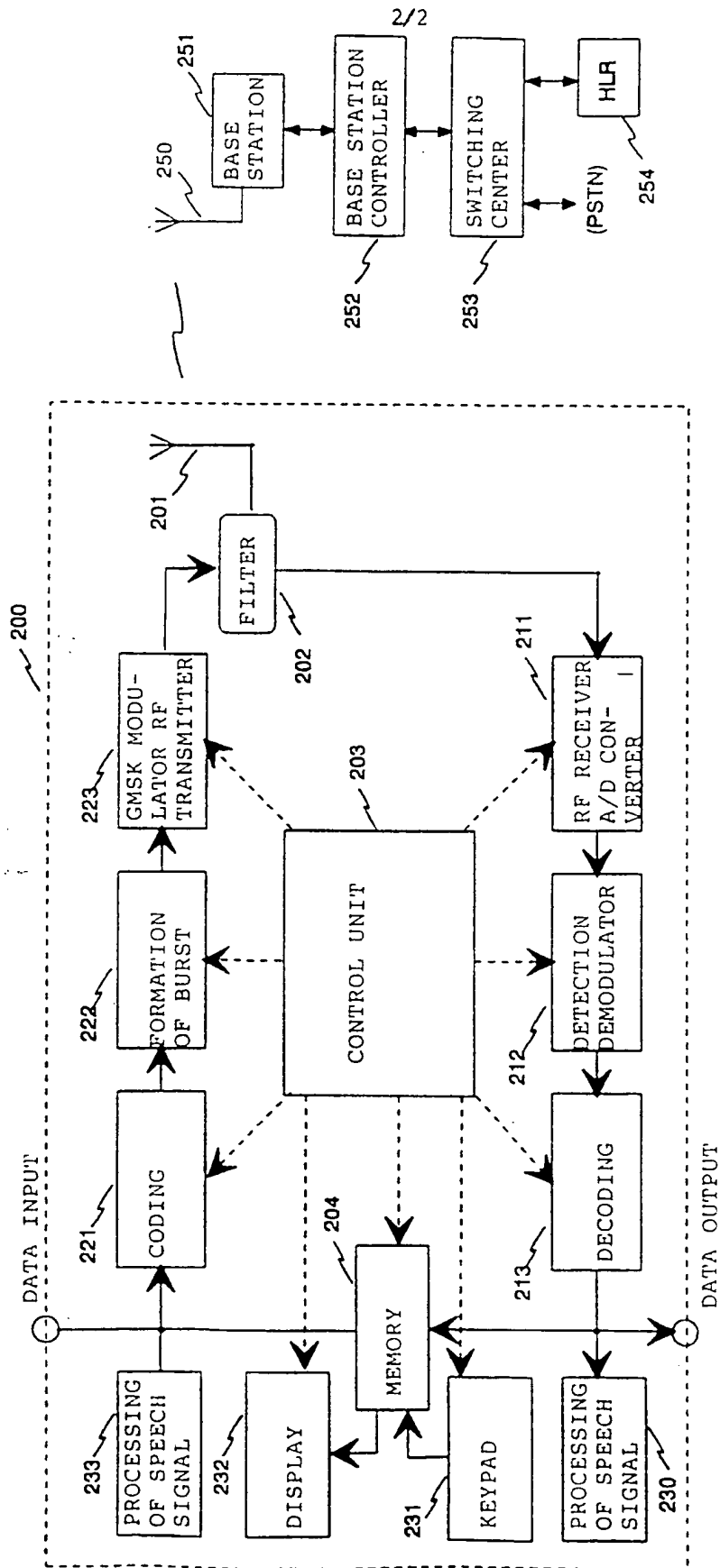


FIGURE 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00120

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/22, H04L 29/02

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L, H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9610320 A2 (NOKIA TELECOMMUNICATIONS OY), 4 April 1996 (04.04.96), page 3, line 21 - line 35; page 4, line 1 - line 30 ---	1-10
A	WO 9635300 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 7 November 1996 (07.11.96), page 4, line 15 - line 30; page 5, line 1 - line 10 -- -----	1-10

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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